



TRILLIUM INC.

Environmental Consultants

**PRIVILEGED AND CONFIDENTIAL
ATTORNEY WORK PRODUCT**

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July 27, 1994

James Gregory, Esquire
McManimon & Scotland
65 Madison Avenue
Morristown, NJ 07960

Re: Runyon Water Shed

Dear Jim:

The University of Delaware (Dr. Nichols) analyzed an extract from monitoring well WE2 that was previously analyzed by Pacific Analytical. The analysis by the University of Delaware was supposed to help us identify the unknown chemicals that were in the groundwater. This was to be done by a special mass spectrometric technique called chemical ionization mass spectrometry (CIMS) using 3% ammonia in methane. This gas mixture is especially good for glycols, alcohols, ketones and other oxygen containing water soluble organic compounds.

I have gone over the GC/CIMS data the University of Delaware produced by this technique. The data is good, but, the gas chromatographic analysis was too short or, in other terms, the analysis included only the small low molecular weight water soluble organic compounds. We intended to identify the larger higher molecular weight molecular compounds. In summary, what the University of Delaware did was part of what we required but not all of what we wanted. Yet, the information obtained may be applied to the direct injection analysis. [Please note that the water sample for the GC/CIMS analysis by direct injection decomposed before the University of Delaware could obtain the appropriate gas chromatographic column for this analysis.] We should ask them to re-analyze the extract for the higher molecular weight compounds.

The GC/CIMS results of the University of Delaware analysis of the extract are given in Table 1, and the GC/EIMS results are given in Table 2. The GC/CIMS chromatogram is given in Figure 1 and the GC/EIMS chromatogram is given in Figure 2.

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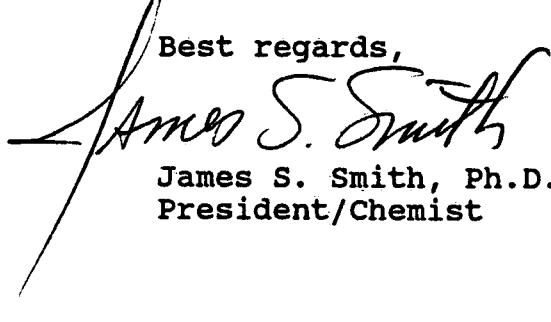
James Gregory, Esquire
July 27, 1994
Page Two

I suggest that we ask the University of Delaware to reanalyze the extract for the higher molecular weight compounds.

The list of compounds in Table 1 and Table 2 should be checked against materials used by CPS. They should also be checked by the direct injection method of analysis by using standards.

If you have any questions, please feel free to call me at your convenience.

Best regards,


James S. Smith

James S. Smith, Ph.D.
President/Chemist

JSS/eh
cc: Larry Pollex

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TABLE 1
Tentative Identification of Organic Compounds
By GC/CIMS

Compound	Scan No.
Unknown	237
Acetone	340
1,1,1-trichloroethane	471
benzene	514
Unknown	555
4-methyl-2-pentanone (MIBK)	627
toluene	695
1,4-dioxane	740
xylene	857
cyclohexanone	872
xylene	888
Unknown	909
xylene	986
ethylene glycol	995
chlorobenzene	1055
N,N-dimethylformamide	1339
4-methyl-4-hydroxy-2-pentanone (diacetone alcohol)	1384
dichlorobenzene	1551
dichlorobenzene and methoxyxylene	1648
Unknown (C ₇ H ₁₆ O ₂)	1703
HOCH ₂ CH ₂ -O-CH = CH ₂	1753
2,4-diaminotoluene	1762
C ₄ acid (butanoic acid)	1762
C ₅ acid (pentanoic acid) and trichlorobenzene	1929
cyclohexyl amine	2015
C ₅ acid	2033
toluidine	2049
Unknown (with a chlorine atom)	2065



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Surrogate ($C_4H_9-O-CD_2CD_2-OH$)	2128
C_6 acid	2171
Unknown (same as scan 2065)	2222
methylcyclohexyl amine	2265
C_8 acid and an unknown (m.w. 104)	2286
methyl carbitol ($CH_3-O-CH_2CH_2-O-CH_2CH_2OH$)	2367
Unknown ($C_7H_{16}O_2$)	2395
Unknown (naphthalene-d ₈)	2492
Unknown (m.w. 266 or 267)	2510

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TABLE 2

Tentative Identification of Organic Compounds
By GC/EIMS

Compound Name	Scan No.
Unknown	238
Acetone	340
Silicone (column bleed - artifact)	354
Benzene	512
Silicon (column bleed - artifact)	554
Methyl isobutyl Ketone (MIBK)	625
Toluene	691
1,4-Dioxane and 1,2-Dichloroethane	738
Silicone (column bleed - artifact)	841
Ethylbenzene	855
Mixture: Xylene and C ₇ H ₁₄ (Methyl Cyclohexane)	871
Xylene	886
Unknown (m/z 69)	906
Xylene	984
Unknown (m/z 79)	992
Unknown (m/z 57)	999
Chlorobenzene	1051
Chlorotoluene	1252
Chlorotoluene	1281
Unknown (oxygenated compound)	1374
Unknown (m/z 83)	1417
Unknown (m/z 57) + Silicone (column bleed - artifact)	1440
Dichlorobenzene	1490
Unknown (oxygenated m/z 101)	1525
Dichlorobenzene	1547
Chlorocyclohexane	1586
Dichlorobenzene and trace alpha-methoxy-p-xylene CAS no. 3395-88-8	1643

Mixture: Dichlorotoluene and unknown (Methyl Ester)	1697
1-Ethyl-4-Fluorobenzene	1723
Unknown (m/z 73 and 88)	1747
2,4-Toluenediamine	1761
Unknown (m/z 57 there is evidence of monochlorination at m/z 151 +163)	1799
Unknown (Acid)	1859
Unknown (m.w. 122, Base Peak @ m/z 78)	1874
Benzoic Acid	1890
Mixture: Trichlorobenzene and Unknown (Acid)	1925
Unknown (m/z 99)	2014
Silicone (column bleed - artifact)	2029
<i>o</i> -Toluidine	2047
Mixture: Trichlorobenzene an unknown (Ketone)	2063
Unknown	2092
Unknown (Acid)	2100
Unknown (Methyl Ester)	2117
Unknown	2130
Unknown - (acetate ester)	2136
Unknown (Acid)	2168
Unknown (evidence of both Bromine & Chlorine)	2220
Unknown (Ester - something like Ethyl Decanoate)	2284
4-Methyl Benzoic Acid	2348
Mixture: Unknown (Acid) & Biphenyl	2393
Mixture: Unknown Acid + Diphenyl Ether (note: biphenyl and diphenyl ether = Dowtherm-a heat exchanger fluid)	2412
Unknown	2472
N-(2-methyphenyl)formamide or propyl aniline	2489
Unknown (m/z 99)	2510
Methyl Benzoic Acid	2740
Methyl Benzoic Acid	2818

FIGURE 1

File:SMITH6 #1-2616 Acq:28-MAR-1994 18:03:56 GC CI+ Magnet AutoSpecEQ
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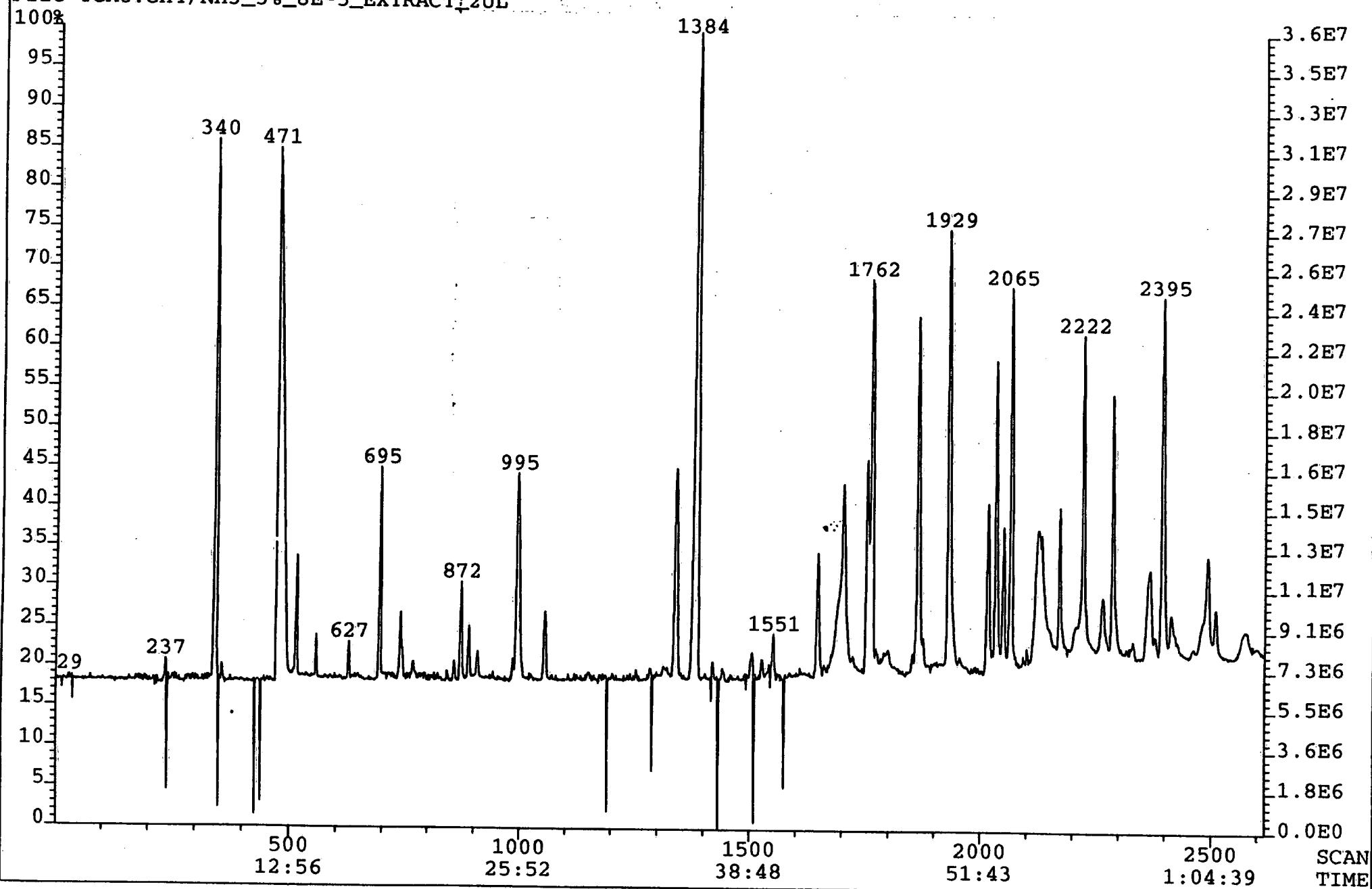


FIGURE 2

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